CLAIMS

1. A method of constructing a polymer support frame over which woven wire cloth is to be stretched and secured to form a sifting screen comprising the steps of locating in a mould tool a wire frame assembly comprising two parallel spaced apart arrays of reinforcing wires, closing the tool, injecting liquid polymer so as to wholly encapsulate the wire frame and to form an article having an open central region criss-crossed by intersecting orthogonal ribs bounded on all sides by a rigid flange, in which each of the ribs includes two parallel spaced apart wires of the said wire frame assembly, permitting the polymer to cure, and opening the tool, and removing the moulded article.

2. A method as claimed in claim 1, wherein the wire frame is selected so as to impart sufficient structural rigidity to the support frame as to prevent deflection thereof and consequent changes in the tension in the wire cloth when fitted thereto.

3. A method as claimed in claim 1, wherein the wire frame is selected so as to impart sufficient strength to the support frame as to allow the latter to withstand shear stresses introduced as the frame is clamped into a vibratory screening machine.

4. A method as claimed in claim 1, wherein the wire frame is formed from high tensile straightened steel wire, bent as required.

5. A method as claimed in claim 4, wherein the wire is of 2.5mm diameter.

6. A method of making a reinforcing wire frame for use in the method of claim 1 comprising the steps of:

- equally spacing apart cut lengths of wire in a jig to form a first array,
- locating thereover a second equally spaced array of cut lengths of wire at right angles to the first array,
- resistance welding the wires of the two arrays at all the points of intersection so as to form a first rectilinear matrix
- similarly positioning two similar arrays of similarly cut lengths of wire in a jig and resistance welding the points of intersection of the orthogonal wires so as to form a second, similar rectilinear matrix,
- bending in a press break the protruding lengths of wire on at least two of the four sides of one of the rectilinear matrices, so as to bend each protruding section first in a generally upward sense and then at a point nearer to its end in a downward sense so that the end region of each protruding length extends parallel to the plane containing the matrix, but is displaced therefrom, and
- and thereafter resistance welding the displaced ends of the protruding wires of the said one matrix to the protruding ends of the wires of the other matrix.

7. A method as claimed in claim 6, wherein the welding is in part effected through the intermediary of transversely extending filler wires, so that intersections are provided where welds are to be formed between parallel protruding ends of the reinforcing wires, and the filler wires facilitate the resistance welding of the parallel protruding ends.

8. A method as claimed in claim 6, wherein the wire frame fabrication is assembled so that each matrix is bowed in an outward sense, opposite to the other.

9. A method as claimed in claim 6, 7 or 8, wherein at least one spacer is located within the wire frame fabrication and is attached to one or other of the matrices so as to extend towards the other, whereby any tendency for the matrices to collapse inwards during moulding, is resisted by the spacer.

10. A method as claimed in claim 8, wherein the spacer comprises a length of wire bent to form a shallow U with its two ends bent outwards to form two in-line lugs by which it can be welded to the underside of one of the wires which form one of the matrices, with the crest of the U section in close proximity to one of the wires of the other matrix, whereby the spacer will maintain a given dimension between the two matrices if the fabrication is subjected to a collapsing force during moulding, so causing the crest to engage the said wire of the other matrix.

11. A method as claimed in any of claims 1 to 5 using a wire frame as claimed in any of claims 6 to 10, wherein an inward force is exerted on opposite faces of the fabrication within the mould tool by fingers protruding inwardly from the inside faces of the tool, to externally engage the opposite matrices of the fabrication when the tooling closes.

12. A method as claimed in claim 11, wherein the fingers sandwich the fabrication in position and produce just the required inward movement of the two oppositely bowed matrices to render them parallel and spaced apart by the desired distance.

13. A method as claimed in claim 11 or 12, wherein the fingers comprise inwardly projecting pegs which align with crossing points of wires in the upper and lower reinforcing matrices, to space the matrices from the corresponding upper and lower internal surfaces of the mould tool and ensure that the matrices are buried within the plastics material which is injected into the mould tool during the manufacturing process.

14. A method as claimed in claim 13, wherein the ends of the pegs taper to an edge, or a point.

15. A method as claimed in claim 13 or 14, wherein after the mould tool is opened and the protruding pegs disengage from the

struts, openings are left in the polymer and the method further comprises plugging the openings with plastics material or filler.

16. A method as claimed in claim 11 or 12, wherein the wire frame fabrication is supported within the tooling by means of retractable pins which protrude through the tooling wall to engage the fabrication and accurately locate it within the tooling.

17. A method as claimed in claim 16, wherein the pins are retracted as the tooling opens after the moulding step has been completed.

18. A method as claimed in claim 16 or 17, wherein the pins align with protruding ends of wires making up the fabrication and are separably joined to the ends of the wires by means of sleeves of plastics material opposite ends of which receive the pins and the reinforcing wire ends respectively.

19. A method as claimed in claim 18, wherein the passage through each sleeve is blocked so as to form two coaxial blind bores, and each sleeve becomes embedded in the polymer during moulding and remains in the polymer as the pin which engages it is retracted as the tooling is opened, the blocked passage serving to encapsulate the end of the wire end located in the inner end of the sleeve.

20. A method as claimed in claim 11 or 12, wherein prior to moulding the tool is fitted with pegs formed from a plastics material which is compatible with or is the same as the polymer material which is to be injected into the mould to encapsulate the wire frame fabrication, and the pegs become integrally bonded therein during moulding so that when the tool is opened, the pegs separate from the tool, and remain in the frame.

21. A method as claimed in claim 20, wherein the protruding

portion of each peg is removed by grinding or filing or cutting.

22. A support frame of polymer material having wire reinforcing therein and to which woven wirecloth is to be bonded to form a filtering screen, in which the frame is constructed in accordance with the method of any of claims 1 to 5 or 11 to 21.

23. A filtering screen comprising a support frame of polymer material with wire reinforcing therein constructed as claimed in claim 22, and having at least one woven wirecloth tensioned thereover and bonded to one surface thereof.

24. A filtering screen as claimed in claim 23, wherein the wirecloth which is first fitted over the support frame has a coarser mesh than any subsequent layer of wirecloth fitted thereover.

25. A filtering screen as claimed in claim 23, having two layers of woven wirecloth fitted thereover and bonded thereto, in which the lower wirecloth has a coarser mesh than the upper wirecloth and in which the tension in the wires forming the upper wirecloth is less than the tension in the wires forming the lower wirecloth.

26. A wire frame reinforcing fabrication for a support frame as claimed in claim 22 formed from resistance welded steel wire matrices arranged in two parallel spaced apart planes and themselves welded together along at least two edge regions by welds between protruding ends of the wires of the two matrices.

27. A method of forming a wire frame reinforcing cage for incorporating in a mould tool for moulding a polymer material therearound to form a support frame for a filter screen, wherein the cage is constructed from two similar rectilinear arrays of resistance welded wires and wherein the method

involves bending protruding wires along at least two sides of one of the arrays and welding the ends of the bent portions of the wires of the one array to the protruding ends of the wires in the other array, so as to maintain separation between the two matrices.

28. A method of constructing a filter screen comprising the steps of forming a polymer support frame having therein a plurality of similarly sized rectilinear apertures defined by an integral rectilinear matrix of wire reinforced struts of polymer material, in which the upper edge of each strut, and the upper surface of each boundary of the support frame, is ridged, and in which the woven wirecloths are fitted over the ridges, tensioned, and secured in place by heating at least the ridges so as to soften the polymer material therein sufficiently to allow the wirecloths to penetrate the crests thereof and upon cooling to remain embedded therein, so as to maintain tension in the wires of the wirecloths after cooling.

29. A method as claimed in claim 28, which also involves the step of differentially tensioning the wires in one wirecloth relative to those in the other, so that different tensions exist in the wires of the two cloths after bonding to the polymer support frame.

30. A method as claimed in claim 29, wherein the reinforcing matrix is formed from high tensile steel wire of nominally 2.5mm diameter, glass reinforced gas blown polypropylene polymer is injected into the mould tool under pressure and is left to cure for a given period of time, and the moulded support frame then removed, a first woven wirecloth of nominally 30 mesh formed from stainless steel wire of nominally 0.28mm diameter is fitted over the support frame and tensioned, a second woven wirecloth is fitted over the first wirecloth, the second cloth being formed from wire having a smaller diameter and a finer mesh size than the first cloth, and is likewise tensioned, a force is applied over the face of the

support frame carrying the overlaid wirecloths, heat is applied to soften the crests of the ridges and to allow the two cloths to become embedded in the crests of the ridges such that after the heating and force is removed and the frame has cooled, the cloths remain bonded to the crests of the ridges and residual tensions exist in the wires forming the two cloths.

31. In a support frame which is to have woven wirecloth bonded to the one face thereof by locally heating the frame material and forcing the wirecloth wires into the softened material before it is allowed to cool and harden again, and which is formed from glass reinforced plastics material having embedded therein a reinforcing wire frame constructed as claimed in any of claims 6 to 10 or 27, the thickness of the plastics material between the reinforcing wires and the face of the support frame members to which the woven wirecloth is to be bonded is selected so as to be sufficient to enable the wirecloth to be embedded therein without making contact with the reinforcing wires.

32. In a support frame as claimed in claim 31, the plastics material comprises a polypropylene or a polyethylene.

33. In a support frame as claimed in claim 32, the plastics material is gas blown and glass fibre reinforced.

34. In a support frame which is formed from glass reinforced plastics material, the faces of the peripheral edge regions of the support frame which woven wirecloth is to overlay and to which the cloth is to be bonded by heating, are formed with a plurality of closely spaced apart parallel ridges so that when the surface is heated, the crests of the ridges soften, and woven wirecloth laid thereover and tensioned can, under an appropriate downward loading, penetrate and become embedded in the softened crests.

35. A method of constructing a filter screen using a support

frame as claimed in claim 34, wherein the heat is applied through the woven wirecloth so as to preferentially heat the crests of the ridges as opposed to the remainder of the support frame.

36. In a support frame as claimed in claim 34, which is generally rectangular, the ridges along each of the four sides run parallel to the length dimension of each side so that the ridges in the surfaces of the four edges of the frame run perpendicular to the direction in which woven wirecloth is tensioned relative to those edges.

37. A support frame as claimed in claim 34 or 36, wherein the frame includes a matrix of wire reinforced struts defining within the boundary of the frame a plurality of openings, and sufficient plastics material exists in each of the struts between the internal wire reinforcement therein and the cloth engaging surface thereof, to enable the strands of wire forming the wirecloth also to become embedded in the struts when the frame is heated and an appropriate force is applied, without the wirecloth making contact with the internal reinforcing wires.

38. In a support frame of glass fibre reinforced plastics material over which wirecloth is to be stretched and bonded thereto to form a sifting screen, and which includes a matrix of struts within a perimeter flange of the frame, the thickness of the cloth engaging ends of the struts is less than that of the more remote regions of the struts.

39. In a support frame as claimed in claim 37 or 38, the wirecloth engaging edge of each strut is of reduced section, and on heating the wirecloth wires become embedded in the said reduced strut sections.

40. In a support frame as claimed in claim 39, the reduced section of each strut is created by forming a ridge along the

wire receiving edge thereof.

41. In a support frame formed from glass fibre reinforced plastics material over which wirecloth is to be stretched for bonding thereto to form a sifting screen and which includes an outer peripheral flange surrounding a central region occupied by an integral matrix of interconnecting struts, the flange and struts are ridged where they are to engage the wirecloth and the ridges extend to different heights so that the crests lie in different parallel planes.

42. In a support frame as claimed in claim 41, the crests of the ridges of the struts defining the integral matrix lie in a first plane, which is below a second plane containing the crests of the ridges on the surrounding flange.

43. In a method of covering a support frame as claimed in claim 42, heat is applied uniformly over the entire face of the support frame by means of by a flat heated platen which forces the wirecloth into the crests of the ridges and the wirecloth has to be pressed into the crests of the ridges on the surrounding flange before it can enter the crests of the ridges on the struts making up the integral matrix.

44. In a support frame as claimed in claim 41 or 42, outer ridges on some or all of the surrounding flange extend to a greater height than inner ridges on the flange, so that the crests of the outer ridges occupy a third plane above the second plane, whereby there is a greater volume of polymer to be melted and spread by the application of heat and pressure to the wirecloth near the outer edges of the peripheral flange, than is the case near the inner regions of the flange.

45. A frame as claimed in any of claims 41, 42 and 44, wherein the overall shape is a rectangle and the flange which extends along the two longer sides is wider than the flange along the two shorter sides, and at least one of the shorter sides is

adapted to be joined to the corresponding shorter side of a similar screen support frame, constructed in the same way as the first.

46. A sifting screen constructed from a support frame as claimed in any of claims 41 to 45, with wirecloth stretched thereon and hermetically bonded thereto.

47. Two screens as claimed in claim 46 insofar as it is dependent on claim 45, when mounted in a supporting framework within a vibratory screening machine, with the shorter edges of the screen support frames joined so that the two screens form a larger area for filtering.

48. A vibratory screening machine when fitted with two screens as claimed in claim 47, wherein one of the screens is mounted so as to be substantially horizontal in use and the other is mounted downstream of the first and is inclined upwardly in the direction of movement of particulate material through the machine.

49. A support frame as claimed in claim 45, wherein one of the shorter ends of the frame is adapted to interlock and sealingly engage with a corresponding edge of an adjoining similar support frame such that if the two frames are slid the one towards the other, engagement and sealing occurs merely by the sliding movement of the one frame relative to the other.

50. A support frame as claimed in claim 49, wherein the sealing engagement of one frame to the other occurs when the two frames are in line.

51. A support frame as claimed in claim 49, wherein the sealing engagement occurs when the two frames are mutually angled.

52. A support frame as claimed in claim 39, wherein the cross

section of each strut is generally rectangular and the longer dimension is generally perpendicular to the plane of the frame, when in a first reinforcing wire extends through each strut near the edge thereof which is to be bonded to wirecloth, and a second parallel reinforcing wire extends through each strut near to the opposite edge thereof, and the wires are bonded to the plastics material by the moulding step and form therewith a beam, thereby to impart rigidity to the structure.

53. A support frame as claimed in claim 39, wherein the struts intersect similar struts which extend at right angles and a second assembly of parallel reinforcing wires is provided, running perpendicular to the first assembly of wires in planes proximate those containing the first said assembly, so that a pair of parallel spaced apart wires extends through each of the struts.

54. A support frame as claimed in claim 53, wherein each reinforcing wire which aligns with the peripheral flange of the frame extends into the flange at each end thereof, thereby to increase the rigidity of the flange.

55. A support frame as claimed in claim 54, wherein the ends of the other wire of each pair are bent so as also to become aligned with the flange of the frame, and the bent ends thereof extend into the said flanges close to the ends of the first mentioned wire to further assist in reinforcing the said flanges.

56. A support frame as claimed in any of claims 53 to 55, wherein the wires touch at all intersections and are welded at all points of intersection.

57. A support frame as claimed in claim 55 or 56, wherein the ends of each pair of wires are welded where they occupy the flange.

58. A support frame as claimed in claim 56 or 57, wherein cross-point engagement is introduced between parallel wires in the flange by incorporating intermediate transversely extending filler wire, or weld wire, between the wire ends.

59. A support frame as claimed in any of claims 56 to 58, wherein further reinforcing is provided in the flange by means of additional reinforcing wires extending parallel to the length direction of the flange so as to overlie or underlie the protruding reinforcing wires entering the flange from the struts, and the additional reinforcing wires are welded to the protruding reinforcing wire ends.

60. A filter screen comprising a support frame as claimed in any of claims 22, 31-34, 36-42, 44-45 or 49-59 having wirecloth bonded thereto, wherein the wires of the cloths are taut and under tension in the finished product and to this end the wirecloths are put in tension at least while the frame material cools and sets hard, to bond the wirecloths to the frame.

61. A method of repairing or refurbishing a filter screen constructed in accordance with any of claims 23-25, 46 or 60, wherein worn or damaged wirecloth is stripped from the surface of the polymer frame, fresh cloth is placed over the frame and tensioned as appropriate and heat is applied so as to soften the surfaces of the frame over which wirecloth is stretched, so that the latter can penetrate the softened plastics material and become embedded therein, after which the assembly is allowed to cool, the tensioning force is removed, and the wirecloth edges are trimmed back to the surrounding flange of the frame.

62. A method of repair or refurbishment as claimed in the preceding claim, wherein plastics material is applied to the surface of the frame which is to receive the wirecloth before the latter is fitted thereover, to provide additional plastics material for bonding the wirecloth to the frame.

63. A method of repairing or refurbishing a filter screen as claimed in claim 61 or 62, wherein the stripped support frame is inserted in a mould and fresh polymer material is injected into the mould so as to reform on the surfaces of the frame ridges similar to those which existed when the frame was first manufactured, before the wirecloth is applied thereto.

64. A method of repair or refurbishment, wherein after removing worn or damaged wirecloth from a support frame, plastics sheet similar in size and pattern of openings to the support frame when viewed in plan is placed over the frame which is to be repaired, in alignment therewith, before or after new wirecloth is stretched thereover and before heat and pressure is applied, to provide additional plastics material to bond the new wirecloth to the frame.

65. A repaired or refurbished filter screen wherein worn or damaged wirecloth has been replaced by fresh wirecloth in accordance with the method of any of claims 61-64.

66. Apparatus for repairing or refurbishing a filter screen from which worn wirecloth has been stripped comprising a tray into which the stripped frame is inserted, wirecloth stretching means surrounding the tray including attachment means for securing to the edges of a sheet of wirecloth laid over the upper surface of the frame in the tray, tensioning means for exerting tension on the wirecloth in at least two different directions whilst it is so stretched over the frame, means for heating the frame to soften the uppermost edges of the matrix of struts and periphery of the frame, and means for forcing the wirecloth into the softened material such that after cooling, the wirecloth remains bonded to the polymer frame, and can be trimmed back to the edges of the frame.

67. Apparatus as claimed in claim 66, comprising further attachment means and tensioning means to enable at least a second sheet of wirecloth to be secured over the first for

bonding to the frame.

68. Apparatus for refurbishing a support frame as claimed in either of claims 66 or 67, wherein additional means is provided for applying plastics material along each of the surfaces to which the wirecloth is to be attached prior to or after wirecloth has been stretched over the support frame, so as to increase the amount of plastics material available to bond the wirecloth to the frame.

69. A support frame for a filter screen constructed and arranged substantially as herein described with reference to and as illustrated with reference to the accompanying drawings.

70. A method of making a support frame for a filter screen substantially as herein described with reference to and as illustrated in the accompanying drawings.

71. A filter screen constructed, arranged and adapted to operate substantially as herein described with reference to and as illustrated in the accompanying drawings.